EXPLANATION OF SIGNIFICANT DIFFERENCES

I. INTRODUCTION

Site Name and Location:

Silver Mountain Mine
Tonasket, Washington
ID# WAD980722789

Lead and Support Agencies, respectively:

U.S. Environmental Protection Agency (EPA)
Washington State, Department of Ecology (Ecology)

Statute that required Explanation of Significant Differences (ESD):

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 117(c) and National Oil an Hazardous Substances Contingency Plan (NCP), Section 300.435(c)(2)(i).

Purpose of ESD:

The purpose of an Explanation of Significant Difference (ESD) is to describe changes in the remedial action due to unforeseen conditions encountered at the site during implementation of the Record of Decision (ROD). Changes found in the conditions at the Silver Mountain Mine site require EPA to modify the remedial actions that were described in the March 27, 1990, ROD. The two changes that EPA is making are:

1. An alternative stock water supply well will not be constructed because adequate groundwater for a water supply was not found in the Horse Springs Coulee where the site is located. Instead, the stock water tank may be reestablished, using the mine drainage; and

2. Post-construction groundwater monitoring will not be performed because: the cleanup actions have diminished threats to the regional groundwater aquifer; a regional groundwater aquifer was not found above the bedrock formation near the site where water was previously thought to be located; and the existing monitoring wells have been damaged beyond use.

These changes are appropriately covered by an ESD because they are significant in terms of the scope of the construction work as specified in the ROD. However, the changes in the remedial actions do not change the risk factors or fundamental cleanup methods described in the ROD.

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Administrative Record:

This ESD will become part of the Administrative Record of the Silver Mountain Mine Superfund site. The administrative Record is available to the public at the following two locations:

Hazardous Waste Records Center (7th Floor)
U.S. Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101;

Or,

Court Administrator's Office
Okanogan County Courthouse
149 North 3rd
Okanogan, Washington 98840

II. BACKGROUND

The Silver Mountain Mine Superfund site is located in Okanogan County, in north-central Washington state, about six air miles northwest from the town of Tonasket. The five-acre site lies in a 358-acre tract of privately-owned land in a north-south running valley known as Horse Springs Coulee. The area around the site is semi-arid with scrub vegetation, and is used primarily for cattle grazing.

Underground hard rock mining for silver and gold began at the site in 1902. By 1956, the sporadic development of the mine produced about 2000 feet of underground workings and several tailings piles in a mine dump consisting of mining waste and mineralized rock. A 400-ton per day mill was constructed in 1952, but was never used. The mill had been removed prior to the Superfund investigations.

From 1980 to 1981, Precious Metals Extraction, Ltd., constructed a cyanide heap leach pile and attempted to extract silver and gold from the previously-mined tailings. The heap consisted of about 5300 tons of mineralized rock in a 100 by 105 by 14 foot pile on top of a 20-mil plastic liner. About 4400 pounds of sodium cyanide was mixed with water and sprayed on the top of the heap. The cyanide-laden solution was then collected in a leachate pond at the base of the heap. The heap leach operation was abandoned in July 1981 without cleanup of cyanide contaminated materials. Cyanide solution remained in the leachate collection pond and in the heap pile. Several empty cyanide drums and large containers of carbon also were abandoned on-site.

In November 1981, Ecology investigated the site, and in 1982, took an emergency action to neutralize the cyanide solution with sodium hypochlorite. After two applications and recirculating the hypochlorite solution through the heap and collection trench, the levels of cyanide dropped from 1100 mg/l total cyanide, to less than 1 mg/l total cyanide in the collection trench. However, some residual cyanide still remained and continued to leach from the heap material. This is evidenced by continued high concentrations of cyanide, measured at 173 mg/kg in the heap pile in 1989. Some natural degradation of the contaminants occurred subsequent to 1989; no cyanide was detected in the soil or heap pile by sampling done during site cleanup in 1992.

In the 1990 ROD, three primary contamination sources were identified at the site: the heap leach pile, the unprocessed rock, and the mine drainage water. Arsenic (approximately 1000 mg/kg) and cyanide (approximately 1100 mg/kg) contaminants were found in the heap leach pile of mined material and in the trench remaining from the abandoned cyanide heap leaching operation. West of the heap pile was a larger pile of unprocessed rock from which the material was taken for the heap leaching operation. The rock also contains the same high levels of arsenic. Mine drainage water from the open mine entrance (adit, portal), also containing high levels of arsenic (approximately 90 ug/l), was piped from within the adit to a cattle watering trough adjacent to the heap leach trench. Water from the trough overflowed and ponded on the site. This standing pool of water near the mine tailings created a pathway to move contaminants into the perched groundwater aquifer beneath the site.

A. Record of Decision

On March 27, 1990, EPA signed the ROD requiring implementation of the following cleanup actions:

- Consolidating and grading approximately 5740 cubic yards of contaminated materials;
- Covering the materials with a soil/clay cap;
- Fencing the site and sealing the entrance to the mine;
- Disconnecting the mine drainage pipe from the existing stock tank and installing a new well in the Horse Springs Coulee aquifer to provide an alternate water supply for the cattle;
- Placing a deed restriction to protect the cap; and,
- Monitoring the groundwater to assure that it does not become contaminated. If groundwater analyses indicate contamination at a concentration in excess of the EPA

health-based levels, a contingent groundwater treatment program will be implemented. Notice will be provided to the community of the groundwater sampling and results and any potential contamination.

These cleanup actions were determined necessary to address threats from exposure to contaminants in the mine tailings and the potential for contamination of the regional Horse Springs Coulee groundwater aquifer if no action was taken.

III. SUMMARY OF EPA CLEANUP ACTIONS

A. Site Inspections

EPA work at the site started in 1988 with the remedial investigation activities to determine the nature and extent of the previously identified problems. Three monitoring wells were constructed around the heap leach pile in October 1988 and their water levels were measured monthly through July 1989. A fourth monitoring well was completed by the June 1989 sampling event.

In the time between the 1988-89 remedial investigation and the construction start in 1991, periodic site inspections were made to ensure the integrity of the site. In 1990, two site inspections were made to provide information for the design of the remedial actions and to check the site for specific changes which could increase the risk.

During these two years, the site inspectors checked the physical condition of the site; the temporary plastic cover over the heap leach pile, the fencing, the visible parts of the monitoring wells, the mine access, and whether cattle or people using the site had caused any damage that would necessitate an immediate action. The plastic cover deteriorated but the damage was confined to the plastic itself and the site remained secured behind the fencing. Overflow water from the stock watering tanks created a muddy area around monitoring well number three and the abandoned well. At times, especially in the spring, there was standing water around the number three well casing and surface seal. There did not appear to be any damage to the monitoring wells or protective casings during this period. The monitoring wells were always capped and the protective casing intact.

B. Construction Completed

Three construction contracts were awarded by the EPA's contractor to perform the construction elements of the remedial action. The first, awarded September 30, 1991, was to stockpile the cover soil which would be utilized to cover the clay cap and

support the final vegetative cover. In 1991, pre-design meetings were held at the site and preparations were made for the soil hauling contract that brought about 8500 yards of top soil to the site in December 1991.

The second construction contract, awarded April 3, 1992, included most of the remaining construction elements to implement the ROD requirements, with the exceptions of well drilling. These construction tasks included: consolidation, capping and covering the waste pile, and fencing. Monitoring wells located on-site were to be abandoned or protected as needed. All four monitoring wells were protected from damage during construction so that they would not require replacement because of the construction activities. Beginning in June 1992, personnel were on-site continuously through August 1992, during the construction of the cap and closure of the mine.

The third construction contract was for well drilling of the alternative stock water well which took place from September 21-24, 1992. The well driller attempted to find water in two locations but was unsuccessful at either location.

Additional site inspections were made in the fall of 1992, and another in May 1993, to evaluate the construction and perform the pre-final and final construction inspections. EPA and contractor personnel were again on-site in August 1993, to begin the post remedial action groundwater sampling that was required in the ROD. During this inspection and sampling effort it was discovered that the four monitoring wells had been filled in and were no longer usable. There was no obvious explanation for this change in the condition of the monitoring wells.

IV. BASES FOR SIGNIFICANT DIFFERENCES

There were two changes in the scope of work that were based on conditions encountered during the construction phase that made the project unable to meet all of the requirements in the ROD. Both of the changes reflect new information about groundwater conditions at the site, but neither impacts the health risk or cleanup standards for the site.

A. Stock Water

The ROD stated that an alternative water supply would be provided to replace the mine drainage as a stock water source, assuming that the Horse Springs Coulee aquifer was a reasonable source in terms of quantity, quality, and depth of water. Two attempts were made to locate a groundwater source to replace the

mine drainage as a water supply for livestock. As stated above, neither of the two attempts were productive and water was not found despite drilling in locations that were determined to be prime locations.

The drilling locations were determined from data based on: a 1970 study done by the Washington Department of Ecology (Ecology) which estimated water levels in the Horse Springs Coulee; and a review of hydrogeology by EPA and its contractors. The first well was attempted in a prime location based on available data. The second attempt was located in the same general area but closer to a shallow surface well utilizing a small perched aquifer. Neither well produced any measurable water and the holes had to be abandoned.

The regional groundwater aquifer was anticipated to be at a depth of about 70-80 feet below ground surface (BGS) and above the bedrock in the selected well locations. The first well encountered the bedrock formation at about 46 feet BGS and drilling continued to a final depth of 320 feet BGS without entering a water bearing zone. The second well was drilled to 73 feet BGS, about four feet into the same bedrock formation.

Since usable and pumpable groundwater was not found near the site, and after reviewing the information about the likelihood of locating an alternative source, EPA determined that additional attempts to locate a replacement water source would not likely be successful. Consequently, EPA has been unable to construct an alternative stock watering well as required in the ROD.

Water is a significant issue because it is important to the usefulness of this area as range land. Since construction of the cap began, the stock water supply has been disrupted. Since water sources are very limited in the vicinity of the site, the evaluation of other sources necessarily focuses on whether the mine drainage could still be used.

The mine seep is identified as the only perennial source of stock water within about a two mile radius of the site. Other small local surface sources become unavailable because of freezing conditions in winter and droughts in the summer and therefore were not developed for stock watering. Although the mine seep water quality does not meet human drinking water standards, it has been further evaluated for an agricultural use as an animal water supply.

During the Remedial Investigation the stock tank showed the highest arsenic concentrations in water found on-site (95 ug/l); the human Maximum Contaminant Level for arsenic in drinking water is 10 ug/l. The baseline site risk assessment, completed in 1990, determined there would be a potential excess cancer risk to

humans of two in ten thousand, based on a future industrial land use scenario. Standard defaults in industrial scenario risk calculations assume that the stock tank water will be used as a drinking water source.

Current guidance recommends using current land use as the best reasonable maximum future exposure scenario unless otherwise warranted. The baseline risk assessment used an industrial land use scenario as the reasonable maximum exposure because mining activities had historically occurred at the site and because it was the mining activities that necessitated site cleanup.

Since the current land use is predominantly as range land, rather than mining, additional risk assessment calculations have been made based on a site specific scenario with the following assumptions:

- the stock tank exists for the sole and explicit purpose of providing a watering source for range cattle;
- any potential human consumption of water from the stock tank, even in a future industrial scenario, is likely to be incidental and not as a drinking water source;
- institutional controls will serve to further reduce the potential for human ingestion of stock tank water. Specific institutional controls will include painting warning signs directly on the tank, and placing a deed restriction on the property stating the water shall not be developed as a human drinking water source; and
- mining activity is unlikely to resume because 1) the property deed restriction for the property reduces the land available to conduct mining operations and 2) the historically low productivity of the mine provides little, if any, economic incentive to resume mining operations.

With these site specific assumptions, new risk calculations were done. Risk to humans consuming the water, allowing very conservative estimates based on deliberate and routine consumption, is approximately three in one hundred thousand--well within EPA's acceptable risk range.

The baseline risk assessment indicated that arsenic concentrations at the site are also well below acceptable levels (200ug/l)[1] for cattle drinking the water and human consumers of the cattle. Additional risk calculations and literature reviews

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[1] "Water Quality Criteria 1972", National Academy of Sciences, Section V--Agricultural Uses of Water, p.310.

have been done to confirm this. Also, a recent sampling event in July 1994 suggests that arsenic concentrations from the mine drainage water may be improving; levels were estimated to be in a range of 46 to 69ug/l. Further, although the baseline risk assessment qualitatively noted an "enhanced" ecological risk from the stock tank, a more recent assessment by EPA's contractor, Roy F. Weston, indicates that no significant ecological concerns arise from the presence of the stock tank.

By allowing the mine drainage to be used as a source of stock water, (e.g., by reestablishing the stock tank), EPA will be able to fulfill the intent of the ROD. EPA will leave the property owner with a stock water supply despite groundwater conditions which prevented establishing an alternative groundwater well for stock watering as originally anticipated.

B. Groundwater Monitoring

The ROD required that the perched groundwater aquifer be monitored after the completion of the remedial action on a quarterly basis. The intent of the groundwater monitoring was to confirm that contaminants found in the perched aquifer did not adversely affect the regional aquifer. It was thought that the four monitoring wells placed on site during the 1988 site investigations could be used for this purpose. After the capping activities were completed and the vegetative cover inspected, the construction was considered complete and a water quality sampling survey was scheduled. This was to be the start of the post-cleanup quarterly monitoring.

The sampling event took place on August 23, 1993. The plan was to survey all of the wells and take water samples for laboratory analysis from the four monitoring wells and the mine seep. Upon sounding the wells for water level, it was found that there was no water and that the wells were not as deep as the construction drawings stated. In fact one of the wells that was originally about thirty feet deep had a depth to soil of only nine feet. The other three wells also had an open hole depth of much less than the depth recorded on the driller's log, and none of the wells had open depths to the elevation where water was encountered during the Remedial Investigation and Feasibility Study (RI/FS).

The cause of this change in the monitoring wells has not been identified. Although structural failure and vandalism were considered, no evidence of any specific cause was identified. During the period between the RI/FS and the construction, there was never any evidence of vandalism of the wells. The wells were protected during the construction activities and personnel were on-site to monitor the construction. During the construction

period the property owner/rancher did not have livestock around the site. Also, all four wells were impacted in a similar manner, not just those easiest to locate or within the construction zone.

Due to the remoteness of the site, site inspections were limited but sufficient to evaluate any changes in the site that would impact the risk to human health or the environment. During the inspections no evidence of damage or changes in the site safety were noticed. If the damage to the monitoring wells was vandalism, it would have required daily monitoring of site activities to identify or prevent it from happening. This level of site securing was not warranted given the types of health risks that were involved. Without further information, EPA is unable to determine precisely how these wells came to be filled with soil.

After a review of the monitoring well depths and considering the lack of useable groundwater near the site, it was determined that site conditions do not warrant reestablishing a groundwater monitoring network for this site. This decision, made in consultation with Ecology, is based on the following site conditions:

1. The perched aquifer beneath the site is not very productive. The monitoring wells require a long time to fill after bailing and no purge volumes can be made; well water is only sufficient to retrieve the sample taken from the well. The soils at the site are not very transmissive, that is they do not easily allow the passage of water through them.

2. During the attempted drilling of the new stock water well, the regional aquifer was not found near the site. EPA selected the drilling locations based on the best available information.

3. Mine seep water, which was originally piped from the mine to a watering trough, was diverted during the site cleanup. Previously the water trough overflowed and the mine water ponded in the area now under the capped waste pile. As a result of this diversion the recharge pathway is no longer through the mine waste dump or heap leach pile and is no longer near the cap. Thus one of the driving forces to move contaminants from the soil into the perched groundwater aquifer beneath the site has been changed and the overall impact to the site reduced.

4. The groundwater information that was generated during the RI/FS identified the compounds and concentrations of contaminants of concern. The risk assessment, using site data, identified arsenic in groundwater as a potential

source of risk to humans (risk estimated as two excess impacts in ten thousand people [$2x10^{-4}$]). The arsenic in the soils were controlled by consolidating and capping the mine waste piles. The arsenic in the perched groundwater aquifer, detected at 14ug/l, was only slightly above the Drinking Water Standard Maximum Contaminant Limit (MCL) of 10ug/l. At the site, groundwater in the perched aquifer is unusable as a water source because of its low production capability mentioned above.

5. The surface water from the mine seep has been measured at 95ug/l (Arsenic (As) in previous years and between 46-69 ug/l more recently. While above the human MCL, these As concentrations are well below the recommended maximum upper limit of 200ug/l As for agricultural uses including stock watering. The mine seep drainage is currently only a concern should it become a water source for human consumption. With the diversion of the mine drainage water away from the mine dump, one of the driving forces that moves the arsenic into the perched groundwater aquifer has changed.

6. This site is located in a remote area that has been historically used as range land and some small mining operations. Without an available water supply, changes in land use would only happen slowly. Protection of human or environmental health will be further ensured by institutional controls. The required deed restriction will indicate the presence of a hazardous condition if the site cap is breached and will prohibit the perched groundwater aquifer, located directly beneath the site, from being developed as a human drinking water supply.

V. SUPPORT AGENCY'S COMMENTS

Ecology has reviewed and concurs with this ESD.

VI. SUMMARY

A change in the planned remedy contained in the ROD was necessary to account for failure to develop an alternative stock watering well and a decision not to sample groundwater. The unforeseen changes were identified during the construction phase and consist of the following:

- Groundwater from the regional Horse Springs Coulee aquifer was not found in two attempts to locate new wells near the site that would have provided an alternative to mine drainage for stock watering.

- The four monitoring wells constructed around the site during the site studies leading up to the ROD were found to be plugged with soil and rendered unusable as groundwater monitoring wells.

These two site conditions were important factors in the EPA decision:

1. To allow the stock water tank to be reestablished, if needed, using the mine drainage, as had historically occurred; and

2. Not to monitor the groundwater.

VII. PUBLIC PARTICIPATION ACTIVITIES

This ESD will become part of the Administrative Record for the Silver Mountain Mine site. Because there has been little community interest in the site, this ESD will be made available to the public, but will not be distributed for public comment. For additional information regarding this ESD, please contact the EPA Project Manager for the Silver Mountain Mine site:

Peter Contreras
U.S. Environmental Protection Agency
1200 Sixth Avenue, HW-113
Seattle, Washington 98101
(206) 553-6708

VIII. STATUTORY DETERMINATIONS

Considering the new information developed during the remedial action and the resulting changes from the selected remedy described in the ROD, EPA believes that the remedy remains protective of human health and the environment. The revised remedy utilizes permanent solutions to the maximum extent practicable for this site and is cost-effective. It complies with the NCP and other federal and state requirements that are applicable or relevant and appropriate to this remedial action.

Approved:

Carol Rushin

Carol Rushin, Chief
Superfund Remedial Branch

10/12/94
Date

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Approved:

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Carol Rushin, Chief
Superfund Remedial Branch

Date

CONCURRENCE

INITIAL	PC		MS		
NAME	pcontreras	sdelaney	mstoner		
DATE	10/11/94	10/11/94	10/12/94		